Aerobic interval training vs. continuous moderate exercise in the metabolic syndrome of rats artificially selected for low aerobic capacity.


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AIMS: The recent development of a rat model that closely resembles the metabolic syndrome allows to study the mechanisms of amelioration of the syndrome by exercise training. Here, we compared the effectiveness for reducing cardiovascular risk factors by exercise training programmes of different exercise intensities.

METHODS AND RESULTS: Metabolic syndrome rats were subjected to either continuous moderate-intensity exercise (CME) or high-intensity aerobic interval training (AIT). AIT was more effective than CME at reducing cardiovascular disease risk factors linked to the metabolic syndrome. Thus, AIT produced a larger stimulus than CME for increasing maximal oxygen uptake (VO\(_{2}\max\)); 45 vs. 10%, \(P < 0.01\)), reducing hypertension (20 vs. 6 mmHg, \(P < 0.01\)), HDL cholesterol (25 vs. 0%, \(P < 0.05\)), and beneficially altering metabolism in fat, liver, and skeletal muscle tissues. Moreover, AIT had a greater beneficial effect than CME on sensitivity of aorta ring segments to acetylcholine (2.7- vs. 2.0-fold, \(P < 0.01\)), partly because of intensity-dependent effects on expression levels of nitric oxide synthase and the density of caveolae, and a greater effect than CME on the skeletal muscle Ca\(_2+\) handling (50 vs. 0%, \(P < 0.05\)). The two exercise training programmes, however, were equally effective at reducing body weight and fat content.

CONCLUSION: High-intensity exercise training was more beneficial than moderate-intensity exercise training for reducing cardiovascular risk in rats with the metabolic syndrome. This was linked to more superior effects on VO\(_{2}\max\), endothelial function, blood pressure, and metabolic parameters in several tissues. These results demonstrate that exercise training reduces the impact of the metabolic syndrome and that the magnitude of the effect depends on exercise intensity.

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